

Claims:

The embodiments of the invention in which an exclusive property or privilege is claimed are, therefore, defined as follows:

1. A method of cleaning comprising the steps of:

selecting a substantially non-reactive, non-aqueous, non-oleophilic, apolar working fluid, said working fluid being selected from the commercial group of non-spark generating materials;

- 5 selecting at least one washing adjuvant, said washing adjuvant being selected from the commercial group of non-spark generating materials;

bringing said working fluid and adjuvant in contact with the fabric;

and applying mechanical energy to provide relative movement within said fabric.

2. The method of claim 1 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm²; and a solubility in water less than 10%.

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3. The method of claim 1 in which substantially all of the materials contacted by said working fluid are conductive polymers.

4. The method of claim 1 wherein said mechanical energy occurs in a chamber which confines said working fluid and fabric.

5. The method of claim 4 including the step of introducing a water-in-working fluid emulsion to the chamber which confines the fabric and said working fluid.
6. The method of claim 5 wherein at least one dispensing chamber is provided and adjuvant is added to said chamber at appropriate times.
7. The method of claim 6 including the step of introducing a water-in-working fluid emulsion into the adjuvant-dispensing chamber.
8. The method of claim 1 including the step of introducing a water-in-working fluid emulsion to the fabric prior to bringing the working fluid in contact with the fabric.
9. The method of claim 1 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.
10. The method of claim 1 including the step of sensing the initial moisture content of the fabric for subsequent adjustment of steps in the cleaning method.
11. The method of claim 1 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash

point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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12. A method of cleaning comprising the steps of:
- selecting a substantially non-aqueous working fluid;
 - selecting at least one washing adjuvant;
 - placing the fabric in a chamber adapted to confine said working fluid and said
- 5 fabric;
- bringing said working fluid and adjuvant in contact with the fabric in the
 - chamber, by introducing a water-in-working fluid emulsion into the chamber;
 - and applying mechanical energy to provide relative movement of said fabric.

13. The method of claim 12 wherein said working fluid is a non-reactive, non-aqueous, non-oleophilic, apolar working fluid

14. The method of claim 13 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm²; and a solubility in water less than 10%.

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15. The method of claim 12 in which substantially all materials in contact with said working fluid are selected from the commercial group of non-spark generating materials.

16. The method of claim 12 in which substantially all of the materials contacted by said working fluid are conductive polymers.
17. The method of claim 12 wherein at least one dispensing chamber is provided and adjuvant is added to said chamber at appropriate times.
18. The method of claim 12 including the step of introducing a water-in-working fluid emulsion to the fabric prior to bringing the working fluid in contact with the fabric.
19. The method of claim 12 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.
20. The method of claim 12 including the step of sensing the initial moisture content of the fabric for subsequent adjustment of steps in the cleaning method.
21. The method of claim 12 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

22. The method of claim 12 wherein the washing adjuvant is selected from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing aids, lime soap dispersants, composition malodor control agents, odor neutralizers, polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches, heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners, abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers, solvents, process aids, fabric softening agents, optical brighteners, hydrotropes, water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction agents, wrinkle resistance agents, soil release polymers, soil repellency agents, sunscreen agents, anti-fade agents and mixtures thereof.

23. The method of claim 26 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.

24. A method of cleaning comprising the steps of:

selecting a substantially non-aqueous working fluid;

selecting at least one washing adjuvant;

sensing the initial moisture content of the fabric

bringing said working fluid and adjuvant in contact with the fabric;

applying mechanical energy to provide relative movement within said fabric;
adjusting steps in the cleaning method in response to the initial moisture content
of the fabric.

25. The method of claim 24 wherein said non-aqueous working fluid is a non-reactive,
non-aqueous, non-oleophilic, apolar working fluid.

26. The method of claim 25 wherein said non-reactive, non-aqueous, non-oleophilic,
apolar working fluid under standard conditions is further characterized by: a KB
value less than approximately 30; a surface tension less than approximately 35
dynes/cm²; and a solubility in water less than 10%.

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27. The method of claim 24 in which substantially all materials in contact with said
working fluid are selected from the commercial group of non-spark generating
materials.

28. The method of claim 24 wherein said mechanical energy occurs in a chamber which
confines said working fluid and fabric.

29. The method of claim 28 including the step of introducing a water-in-working fluid
emulsion to the chamber which confines the fabric and said working fluid.

30. The method of claim 24 wherein the above sensing step is carried out by sensing the humidity of the fabric to be cleaned.
31. The method of claim 24 wherein the above sensing step is carried out by sensing the conductivity of the fabric.
32. The method of claim 24 wherein the above sensing step is carried out by sensing the humidity of the air.
33. The method of claim 24 wherein the above sensing step is carried out inside the chamber.
34. The method of claim 24 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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35. A method of cleaning comprising the steps of:

selecting a substantially non-reactive, non-aqueous, non-oleophilic, apolar working fluid;

selecting at least one washing adjuvant from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing

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aids, lime soap dispersants, composition malodor control agents, odor neutralizers, polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches, heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners, abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers, solvents, process aids, fabric softening agents, optical brighteners, hydrotropes, water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction agents, wrinkle resistance agents, soil release polymers, soil repellency agents, sunscreen agents, anti-fade agents and mixtures thereof;

bringing said working fluid and adjuvant in contact with the fabric; and

applying mechanical energy to provide relative movement within said fabric 1.

36. The method of claim 35 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm²; and a solubility in water less than 10%.

37. The method of claim 35 in which substantially all materials in contact with said working fluid are selected from the commercial group of non-spark generating materials.

38. The method of claim 35 in which substantially all of the materials contacted by said working fluid are conductive polymers.
39. The method of claim 35 wherein said mechanical energy occurs in a chamber which confines said working fluid and fabric.
40. The method of claim 35 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.
41. The method of claim 35 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.
42. A method of cleaning comprising the steps of:
- placing the fabric in a chamber adapted to confine said working fluid and said fabric;
 - sensing the initial moisture content of the fabric;
 - 5 selecting a substantially non-aqueous working fluid, said working fluid being selected from the commercial group of non-spark generating materials;
 - selecting at least one washing adjuvant from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing
 - 10 aids, lime soap dispersants, composition malodor control agents, odor neutralizers,

polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches, heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners, abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers, solvents, process aids, fabric softening agents, optical brighteners, hydrotropes, water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction agents, wrinkle resistance agents, soil release polymers, soil repellency agents, sunscreen agents, anti-fade agents and mixtures thereof;

said washing adjuvant being selected from the commercial group of non-spark generating materials;

bringing said working fluid and adjuvant in contact with the fabric in the chamber, by introducing a water-in-working fluid emulsion into the chamber;

applying mechanical energy to provide relative movement of said fabric; and adjusting steps in the cleaning method in response to the initial moisture content of the fabric.

43. The method of claim 42 wherein said working fluid consists of a non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions, said working fluid further being characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm²; and a solubility in water less than 10%.

44. The method of claim 43 in which substantially all of the materials contacted by said working fluid are conductive polymers.

45. The method of claim 44 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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46. The method of claim 43 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.

47. The method of claim 42 including the step of introducing a water-in-working fluid emulsion to the chamber which confines the fabric and said working fluid.

48. The method of claim 42 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.

49. The method of claim 42 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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50. The method of claim 42 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.